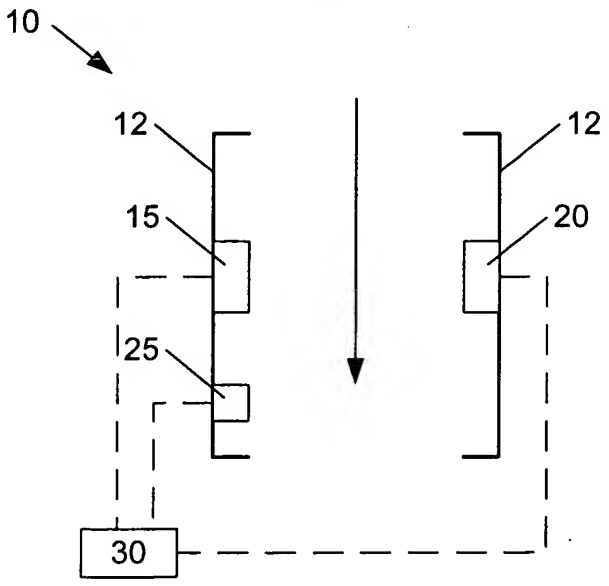
REMARKS

Reconsideration of this application in view of the above amendments and following remarks is respectfully requested. Claims 1-7, 9-15 and 17 are now pending. Claims 1, 13 and 17 have been amended. Claims 8, 16 and 18-22 have been canceled.

Drawings

Figure 1 (reproduced below) stands objected due to reference to item "30" therein. As disclosed in the specification as originally filed, Figure 1 depicts an acoustic gas sensor 10 for measuring the hydrogen concentration of a gas (represented by the arrow) passing through housing 12. A transmitting transducer 15 and receiving transducer 20 are positioned in housing 12 a fixed distance apart and driven by electric signals. In addition, a temperature sensor 25 may be present to measure the temperature of the gas and eliminate the temperature dependence of the velocity of sound in the gas. (*See, e.g.,* specification at page 5, lines 6-16.)

Figure 1



For purpose of clarity, Applicants have amended the specification at page 5, lines 6-16, to identify controller 30 for measuring the hydrogen concentration of the gas passing through the acoustic gas sensor, wherein in the controller is in communication with transponders 15 and 20, and with the temperature sensor 25 (as indicated by the dashed lines). Applicants

submit that this amendment is merely for purpose of clarity and does not constitute addition of new matter.

In view of the amendment to the specification, reference to item "30" in Figure 1 is proper and withdrawal of this objection is respectfully requested.

Amendments to Specification

Applicants have also amended the specification at pages 1 and 2 in the manner noted by the Examiner; namely, "can" has been changed to read "and" at page 1, line 10, and the phrase "(now U.S. Patent No. 6,852,434)" has been added at page 2, line 13. (The patent number noted by the Examiner was not correct.)

Rejection of Claims 1-17

Claims 1-8 and 13-16 stand rejected under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 6,242,120 to Herron (Herron) in view of published UK Patent Application GB 2 210 977 to Atkins (Atkins), while claims 9-12 and 17 stand rejected further in view of U.S. Patent No. 6,541,141 to Frank et al. (Frank) for the reasons set forth at pages pages 3-8 of the Office Action. Applicants respectfully disagree.

Herron is directed to optimization of a fuel cell purge cycle by measuring a "process parameter" indicative of the rate at which water is being produced in the fuel cell, and purging the fuel cell if the measured value exceeds a threshold value. Referring to Figure 1 of Herron, sensor 42 measures the value of the process parameter that is representative of the performance of the fuel cell. Examples of suitable process parameters include the cumulative amp-hours and/or power produced during an operative cycle (*see* col. 3, lines 64 to col. 4, line 1). "Any other suitable process parameter meeting the condition of being correlated to the performance of the fuel cell stack, such as the rate of hydrogen consumption by the fuel cell stack, may be used ..." (*see* col. 4, lines 8-12).

The Examiner relies upon the underlined text in the prior paragraph for teaching a hydrogen gas sensor. It is, however, a stretch to read Herron in the manner suggested by the Examiner since hydrogen consumption can be measured by any of a variety of measurements apart from measuring hydrogen concentration. However, while there is no express teaching in Herron of a hydrogen gas sensor, Applicants assume the Examiner is of the opinion that there is

at least a suggestion of the same. To this end, Applicants wish to direct the Examiner's attention to Published U.S. Patent Application No. 2002/0110713 (published August 15, 2002), now U.S. Patent No. 6,852,434 to Reindl et al. ("Reindl") (*see* Background of the specification at page 2, lines 12-16). Reindl specifically discloses a hydrogen gas sensor associated with either the fuel or oxidant passages for measuring the concentration of a gas (*e.g.,* hydrogen) in the fuel or oxidant streams.

Thus, assuming one skilled in the art wished to incorporate a hydrogen gas sensor in the fuel cell system of Herron to measure the rate of hydrogen consumption, Applicants submit that one would look to Reindl for this purpose. To that end, Reindl discloses an "improved sensor [that] is particularly suited for use in the environment within the reactant fluid passages of a solid polymer fuel cell assembly and is tolerant to the presence of water" (*see* Reindl Abstract). In particular, the hydrogen gas sensor of Reindl contains active and passive electrodes (*e.g.,* platinum and gold, respectively), and an electrolyte in contact with both electrodes. The electrolyte is disposed on a substrate and a heater is in thermal contact with the substrate for heating the substrate and electrolyte (*see* Figure 7 of Reindl depicting a representative sensor).

Accordingly, if one skilled in the art wished to modify Herron in the manner suggested by the Examiner, Applicants submit that the improved sensor of Reindl would be an appropriate choice. What is not suggested or motivated by Herron and/or Reindl is the acoustic gas sensor of the present invention, which is much less sensitive than the sensor of Reindl. As disclosed in the specification at page 7, lines 21-27, the use of a highly sensitive gas sensor is not necessary when measuring the anode exhaust. Instead, the gas sensor of the present invention need only provide some additional control for purging the anode exhaust and thus avoid, for example, fuel starvation.

An acoustic gas sensor, while less accurate than the gas sensor disclosed in Reindl, is still sufficient in the context of this application. Acoustic gas sensors have been found to be particularly useful in binary gas systems (*i.e.,* gas systems containing only two gases). On the other hand, acoustic gas sensors are less accurate in the context of gas systems containing three or more different gases (such as the gases existing a fuel cell). For gas systems having

three or more different gases present, the concentration of one gas (*e.g.*, hydrogen) may be masked by the change in concentration of the other gases present (*see* specification at page 6, lines 6-14). However, at least in the context of an electrical chemical fuel cell, it has been found that such masking does not detract from the measurement in a manner sufficient to render the acoustic gas sensor impractical for this application. Stated differently, one skilled in the art would not look to modify Herron and/or Reindl by incorporation of an acoustic gas sensor.

Lastly, while Atkins does disclose an acoustic hydrogen gas sensor, there is absolutely no motivation or suggestion to use the same in the context of a fuel cell. Instead, Atkins is directed to measuring hydrogen in the context of domestic gas meters for natural gas (*i.e.*, a binary mixture of hydrogen and methane). In fact, the use of the acoustic gas sensor in such a binary system represents its customary application, and one skilled in this field would not look to utilize the same to measure the hydrogen concentration in the non-binary system represented by the anode exhaust of fuel cell. To clarify that the measurement is of the non-binary anode exhaust gas, Applicants have amended claims 1 and 13 to recite the text of claims 8 and 16, respectively, have canceled claims 8 and 16 to avoid duplicative claim language, and have amended claim 17 to depend from claim 13 rather than canceled claim 16.

As for the further addition of Frank, this reference does not cure the deficiencies discussed above with regard to the selection of an acoustic gas sensor for measuring hydrogen concentration of the anode exhaust.

Thus, Applicants submit that claims 1-7, 9-15 and 17 are patentable over the cited references, taken in isolation or in any combination, and request that this ground of rejection be withdrawn.

Rejection of Claims 18-22

Claims 18-20 stand rejected under 35 U.S.C. §102(b) as anticipated by Atkins, and claims 21-22 stand rejected under 35 U.S.C. §103(a) as obvious over Atkins in view of Herron, for the reasons set forth on pages 8-9 of the Office Action.

While not agreeing with the rejection of these claims, Applicants have canceled claims 18-22 in order to expedite consideration and allowance of the remaining claims. Of

course, Applicants reserve the right to continue prosecution of the canceled subject matter in a corresponding application.

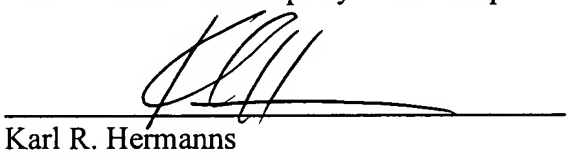
Conclusion

In view of the above amendments and remarks, allowance of claims 1-7, 9-15 and 17 is respectfully requested. A good faith effort has been made to place this application in condition for allowance. However, should any further issue require attention prior to allowance, the Examiner is requested to contact the undersigned at (206) 622-4900 to resolve the same.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,

SEED Intellectual Property Law Group PLLC



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